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# NOTES ON A CASE OF SUCCESSFUL OPERATION FOR CONGENITAL CATARACT IN AN ADULT.

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I. *The patient as a blind man.* II. *Condition of the eyes, before and after the operation.* III. (*a*) *Perception*, (*b*) *Visualising, Association, etc.* *Brief notes of two other cases.*

A REMARKABLE addition has recently been made to the cases of successful operation for congenital cataract. Its psychological results tend in great measure to confirm those of previous observations, but it has features which, I think, make it worthy of consideration on its own account. The operator was Dr A. Maitland Ramsay, of the Glasgow Ophthalmic Institution, who has printed a pamphlet in which he describes the case[1]. This pamphlet he has kindly allowed me to use freely. The earliest observations were all made by Dr Ramsay and his assistant. The operation on the right eye was performed on March 11, 1903, and that on the left eye a week later. I did not have an opportunity of seeing the patient until April 27th. I saw him again on May 4th, May 9th, and October 23rd.

## I. *The patient as a blind man.*

The patient, John Carruth, is 30 years of age. "He is one of a family of seven, and although, as far as can be ascertained, there was no hereditary predisposition to blindness, one sister, as well as himself, was born blind, and another (who died at thirty-five) lost her sight

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[1] Printed for private circulation, and now out of print. Notes on Carruth's case were published by Dr Ramsay in the *Lancet* of 16th May 1903.

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when she was two years old. The rest—a brother and three sisters—are said to have been able to see perfectly well. The sister who was born blind, now 33 years of age, was brought up in the Blind Asylum, but the patient himself was allowed to run about as he pleased, no attempt to educate him having ever been made." This sister has also been successfully operated upon by Dr Ramsay, and I have had an opportunity of seeing her. Her case is less interesting than that of her brother, and I shall afterwards say something about the difference between them. To return to John Carruth. He was "so familiar with the district in which he resided" (Bridge of Weir, a small country town in the neighbourhood of Glasgow) "that he could go about without the slightest fear, and he says that one of his greatest pleasures in life was to rise early on a fine spring morning and walk in the country to listen to the singing of the birds, to enjoy the freshness, and to 'have a good think.' His hearing was so acute that he knew at once if there was anything unusual on the road along which he was walking, and thus he never had any difficulty in keeping himself out of danger. The 'sense of obstacles' spoken of by psychologists was indeed developed to such a degree that he hardly ever came in contact with what might be in the way; he seemed to perceive the obstruction as he approached and was thereby enabled to avoid it." On questioning him, however, I could not find that he had any definite experience of the "facial perception" described by the blind author, Mr W. Hanks Levy (*v.* James, *Principles of Psychology*, Vol. II. p. 204). He could not explain his feeling of the presence of untouched objects; but he did not believe it was due to differences in the currents of air striking the face, and he was inclined to attribute it entirely to hearing. "As he passed along a road he could tell a wall from a hedge by the sound of the air coming through the leaves and branches of the latter. He could easily go on an errand to any house in his native village, for the resonance of his footfall—quite different in sound when he was passing a building, from what it was when he was opposite an open space—enabled him, perfectly familiar as he was with his surroundings, to count the houses as he passed, and thus to turn corners and finally stop at the one he wanted. In a strange place, however, he could never trust himself to go about without a guide, because his sense of hearing conveyed nothing to him beyond the difference between passing buildings or open spaces, and number could not come in to render the auditory impressions definite." It should be remarked that, in his native village, the great majority of the houses are detached. In passing along a street he could ascertain his position when there were open entries ('pends') or crossings. He had so trained his sense of hearing that he once, on the road, told a farmer that his horse had lost a shoe, although the farmer was quite unaware of it. He worked for some time as a gardener, and "he learned to pluck flowers, arrange them in bunches and pack them in boxes for market, not only without the slightest difficulty, but with very great accuracy. He distinguished different blossoms partly by touch, but chiefly by smell; and by dint of asking questions, he got at last to know so much about their form and colour, that he could arrange them in a bouquet. He recognised the presence of strangers in the house chiefly by the sense of hearing—for example, he could discriminate persons whom he knew by the sound of their respiration, and he was at once cognisant of any breathing with which he was unfamiliar. Besides this, however, he says that if he came into the house when any strange person was there he experienced a sense of 'fulness.' He is unable to put this in clearer terms, and the feeling may correspond to that ascribed by Wardrop, in his 'History of James Mitchell, a boy born blind and deaf,' published in 1813, to a highly developed sense of smell." In the record of James Mitchell's case, however, there does not seem sufficient ground for connecting this perception of the presence of strangers with the sense of smell. In the account of James Mitchell given by "a clergyman in the county of Moray" (*Collected Works of Dugald Stewart*, Vol. IV. p. 314), it is said that "when a stranger arrives his smell immediately and invariably informs him of the circumstance, and directs him to the place where the stranger is, whom he proceeds to survey by the sense of touch.... It has occasionally happened that visitors have arrived in a carriage, and on such occasions he has never failed to go to the place where the carriage stood." But as James Mitchell was deaf as well as blind, this is merely an inference from the fact that he did not obtain the information by sight (even although his eye had been imperfectly operated on). And Dr Gordon said of him: "His sense of smell is unquestionably extremely acute. But I have not been able to learn any fact which could lead me to believe that he could, in a room at least, discover a person by this sense alone, at the distance of twelve feet....As to a power of determining the *direction* of an object, by some *distinct quality* in its odour, like that quality in sound by which we discover the direction of a sounding body, I could not perceive that he enjoyed any such power more than other persons" (*loc. cit.* p. 352). Carruth's word "fulness" suggests to me that the sensation of the presence of a

stranger may possibly be a development of the general (somewhat uncomfortable) feeling of proximity to another person, the feeling of being crowded, even when there is no actual contact. In the case of people who see, the feeling arises only when there is very close proximity; but this may be merely due to the fact that we *see* that the other person is not uncomfortably near. The blind man has no such means of retarding the rise of the feeling. Yet this does not explain why the blind man should observe the presence of *strangers* alone in this way. Possibly he is aware of the presence of his friends in other ways, and has merely a feeling that the small room he enters has more people in it than usual.

To return, however, to the narrative, Carruth "occasionally worked in the harvest-field, and could bind the corn and arrange the stooks as well as any of the other labourers. He says he was even able to build the sheaves on a cart, and naïvely adds that although the load might not look 'elegant,' yet it always remained firm on the cart. At other times he assisted in trimming turnips with a large, sharp knife, and only on one occasion did he cut himself. He was also employed to feed cattle and was guided to their stalls by hearing. As a boy he was a leader in every game and would climb the highest trees, birdnesting as fearlessly as any of his companions." "He was a grocer's assistant for a time, and before he was many weeks in the shop, he knew the weights so accurately that he was able to weigh all forms of dry goods and parcel them up. He also went round the houses every morning for orders, and when he returned to the shop he had instructions from six or eight different people to send goods comprising from forty to sixty different articles. Every one of these he remembered after it had once been told him, and ho afterwards packed his basket and distributed the groceries to the customers." This information, I may say, was given in a letter written by the grocer whom Carruth assisted.

## II. *Condition of the eyes, before and after the operation.*

"The eyes were small, deeply sunk, and moved continuously in the sockets, and there was a very pronounced alternating convergent squint. The irides were natural, the pupils active, and the intra-ocular tension normal, but both lenses were completely cataractous. The patient was quite unable to distinguish objects, although he could tell day from night, and could easily perceive a light and locate it accurately." He does not, however, "appear to have had any pleasure in its brightness," and he "seems to have had no perception of bright colours." By the operations both lenses were removed, after a "preliminary iridectomy, in order to test the vulnerability of the ocular tissues." "Chloroform was administered, as the patient was quite unable to control the movements of his eyes," and after the operations the bandage had to be removed and dark spectacles substituted, owing to the irritation caused by the constant motion. Writing on the 20th of May Dr Ramsay says: "The squint and ocular restlessness are less pronounced than they were, but the patient has still very little control over the movements of the eyes. When he is requested to look in any particular direction he is unable to cause the ocular muscles to do what he wishes, and the balls oscillate, and one or other turns inwards to such an extent that a portion of the cornea is hidden by the inner canthus. This want of control renders it very difficult to make a satisfactory ophthalmoscopic examination, but as far as can be made out the fundus oculi is normal; indeed, the functional activity of the optic nerves since the cataracts were removed is very remarkable, and is in striking contrast to the purposeless muscular movements." When I saw him on October 23rd both the squint and the ocular restlessness had entirely disappeared, and the eyes seemed to be completely under control.

## III. *Psychological observations after the operation.*

(*a*) *Perception.* "For about ten days after the operation on the left eye the patient appeared quite dazed, and could not realise that he was seeing. The size of everything in the ward seemed very much exaggerated, and on that account he had great difficulty in interpreting what he saw, but, as he is inquisitive, and has a keen desire for knowledge, he took from the outset a most intelligent interest in his own case, and asked numerous questions of his fellow-patients." This conversation with his fellow-patients, of course, spoiled him to some extent as a psychological subject. At any rate it must be borne in mind in drawing conclusions from his statements. "The first thing he actually perceived was the face of the house-surgeon. He says that at first he did not know what it was he saw, but that when Dr Stewart" [who was bending over him] "asked him to look down, the sense of hearing guided his eye straight to the point whence the sound came, and then, recalling what he knew from having felt his own face, he realised that this must be a mouth, and that he must be looking at a face." It should be added that he felt his own face with his hand while he

looked. "Once he properly understood what vision meant, he made very rapid progress, and his extraordinarily retentive memory enabled him to take full advantage of everything he was told." In this respect he differed from some of the patients in former cases, who learned things only after frequent repetitions. This quickness of apprehension is probably due, in part at least, to his comparatively highly-developed system of knowledge obtained through other senses than sight. He told me, *e.g.*, that he recognised certain objects as pictures, because he knew that pictures hung on walls.

"He was quite ignorant of colour, but learned to distinguish hues very quickly. The first tint that he saw was red. A red blanket lay across the foot of his bed. He asked what it was, and was told; and never afterwards did he have the slightest hesitation in discriminating red again. He was shown a narcissus, and on being asked to describe it he immediately recognised the flower, and knew, from his old bouquet-making experience, that it was white and yellow; but he now for the first time also became aware of the little red band in the centre, and at once called attention to it. When he was shown a bunch of daffodils he recognised them by their smell, and immediately said they must be yellow. The colour that took him longest to master was green, but he can now name all ordinary tints readily and correctly. His difficulty with green is hard to explain, unless it be that with green he has no smell-association such as he had with coloured flowers. That there was such association seems evident from his answers when he was asked to describe a dark ruddy brown, namely, that he did not know what to call it, but he thought it must be like wallflower." The colours with which he was tested were not pure primary colours, and his difficulty with green may have been due in part to the differences in the greens which were put before him, and their approximations to yellow or to blue. His description of a dark ruddy brown as "like wallflower" is very difficult to understand, for he had not *seen* wallflower nor, apparently, had he known beforehand that the colour he was asked to describe was brown. He may possibly have seen other shades of brown and, associating brown with wallflower from his previous knowledge, may have meant that this, which he saw, was a kind of brown. I cannot explain it in any other way.

When I saw him on October 23rd I again tested his power of recognising colours and found that it was considerably reduced in artificial light (electric). On the walls of the room there were large coloured diagrams of the eye—almost entirely red. He took a considerable time (at least half a minute) to identify the colour. There was also a bunch of chrysanthemums (of various colours) in a flower-glass. He passed over some white blooms, which were nearest to him, and looked at some others of a mauve colour. After some hesitation (saying, "I don't like to make a mistake"), he said that they seemed to be red. Then he returned to the white flowers, and recognised their colour at once. I had not remarked on the artificial light, but he drew attention to it himself, and said that he always found it difficult to recognise colours except in sunlight. "Even yellow," he said, "looks different in artificial light[1]."

In connexion with his perception of form, as distinct from colour, some interesting observations were made. "When asked to distinguish between a ball and a toy brick, he looked at them attentively for a considerable time, his hands meanwhile moving nervously, as if he were trying to translate what he saw by comparing it with an imaginary tactile impression, and then he described both correctly" [*i.e.* the one as round, the other as 'square']. "He explained that he was so much in the habit of handling objects that he had come to have a 'notion in his mind' regarding the form of things." This might be taken as, to a great extent, a confirmation of the view of Dr T. K. Abbott (*Sight and Touch*, pp. 141, 2). "The problem," he says, "as usually stated, is not to identify the cube seen with the cube felt, absolutely; but the man is supposed to know that one of the two bodies before him is a cube and the other a sphere, and he is only required to find a visual difference of the same kind as the known tactual difference between them. Now suppose he has acquired by touch the notion of a straight line, this notion is suggested by all the edges of a cube, and is wholly excluded by the sphere. But it cannot be questioned that the idea of a straight line can be obtained by sight, and that in whatever way the cube is looked at, it is bounded by straight lines, which the sphere does not present in any aspect. This furnishes a characteristic quite sufficient for the identification. But sight gives also, I will not say the idea of an angle, but the contrast of continuity and interruption. When the eye traverses an edge of the cube it comes to an abrupt stop, and the look must turn in a different direction several times in the circuit, and a similar change occurs when the cube is handled. But the globe gives to both senses the idea of a continuous uniform outline. Hence we conclude, without reference to the perception of

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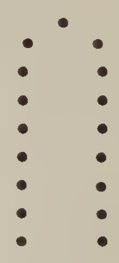
[1] Carruth has since been found to have considerable weakness of vision for red and green, if not actual red green blindness.

solidity at all, that if the blind are capable of acquiring the ideas in question, they will, on being made to see, be competent to name correctly the globe and cube which they have previously felt. Consequently if, upon being fairly examined, they appear incapable of doing so, it will follow that the defect is not in sight, but in touch, not in their new sense, but in their old ideas." Carruth's 'notion' seems explicable by the first part of Dr Abbott's statement. I found that, before the cube and sphere experiment was made, he had had visual experience of the difference between things straight and curved, *e.g.* the straight backs of chairs, the curves of faces, etc. His 'notion' may have been formed in this way. His own statement about his habit of handling objects and the nervous movement of his hands while he was coming to a decision seem to indicate something like what is described by Dr Abbott in the second part of his explanation. But I do not feel sure about this, for the continual restlessness and absence of control in his eyes seem inconsistent with a recognition of the contrast between continuity and interruption in the movement of the eyes from point to point in the object.



The recognition of form in Carruth's case advanced rapidly. On May 4th I was seated beside him on a bench perforated with holes, forming pointed arches, the lower parts being straight and the upper parts curved. He did not at first recognise the holes as holes but took them for black spots. When I asked him whether they formed straight lines or curves, he answered quite correctly. I then asked if he knew what an arch was. He said he supposed I meant the sort of thing that was sometimes to be found on the top of a garden gate, indicating with his hands a low, flat arch. I asked if the top part of the figure on the bench was an arch. He said "No"; but after looking at it for a few moments he remarked that if the topmost hole were brought down between the two next to it it would be an arch. This seems to me very difficult to explain and at the same time highly suggestive. Before his talk with me Carruth had either not seen anything shaped like a flat arch or, if he had seen such a thing, he had at least not definitely thought of it as an arch. Further, he did not at that time visualise[1], he had no definite visual images, and consequently it was impossible for him to make his statement on the basis of a mental comparison between what he perceived and the visual image of a flat arch. Yet the action of his hands indicating what he supposed a flat arch to be showed that he might conceivably have drawn a flat arch. His hand drew a flat arch in the air. So that the flat arch existed for him as a sort of motor function. How he translated this into the idea contained in his final statement I cannot explain. It might, I think, be explicable on the lines of Dr Abbott's suggestion regarding continuity and interruption. If the curve had come to mean continuity in the change of direction of the eye (analogous to continuity in the change of direction of the hand), the eye may have gone continuously to the topmost hole, encountered interruption there, fallen back again, and finally crossed from the second highest hole on the left side to the second highest hole on the right without breach of continuity. This would at once suggest the lowering of the highest hole. This seems plausible, but there remains the difficulty of the restlessness of the eyes.

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[1] Cf. below, p. 146.

The patient "rapidly learned the letters of the alphabet and figures, and he will soon be able to read and reckon." Acting on the doctor's advice, however, he has not meanwhile carried this further, as he finds it exceedingly difficult to identify such small things as printed letters. This is due not merely to a necessarily imperfect power of discrimination in the early stages of his sight-experience, but also to the kind of spectacles he uses, which are not suited for near vision. "He could count accurately after he had looked at objects one by one, and seemed to derive much help in his calculations by pointing with his finger. Here again he seems to translate touch into vision, and to arrive at a perception of the whole through perception of the individual parts. He cannot take in things at a glance. He does not see the passers-by on the opposite side of the street quickly. He looks most intently and moves his head backwards and forwards, and from side to side, as if trying to get a view of them all round before he can make up his mind what he is seeing—in a room, however, he can distinguish things much more quickly." My own impression from observing him is, not that he pieces things together by a separate study of their parts, but that he goes on looking until he finds something which suggests the whole and is then satisfied at having recognised it. He sees buildings and other large objects best from above. This is probably due to his want of practice in 'filling out' visual signs, on account of his want of familiarity with the visible appearances of different types of buildings, etc. Except in the case of points and gleams of light, his range of distinct vision is not great[1]. "One of the things that gave

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[1] Cf. below, p. 145.

him peculiar pleasure was looking at the face of a watch which he had borrowed from a fellow-patient. Within a day or two of his having got the loan of it he astonished me by announcing that he was able to tell the time. When I asked him how he had learned so quickly, he said that he did not understand the figures on the dial, but he had been told how to count the hours, and that each space between the 'black marks' meant five minutes."

"He was able to estimate size and distance more readily than might have been anticipated, although he says that he feels that if he were out of doors by himself he would be 'wandered.'" When he did leave the hospital, he was, as might have been expected, very much confused by the life of the streets and the variety of things he saw. "From the time he got out of bed after the operation he could guide himself with ease through a doorway and walk about on the level." When I saw him he would walk in a straight line to the door, holding his right hand slightly out until he grasped the handle. But he walked forward without the slightest hesitation. "He had considerable difficulty in ascending a stair, because the steps seemed so high that, to begin with, he raised his foot much higher than was necessary and, without meaning to do so, went up two steps at a time. Whenever he discovered his mistake he began to pay attention to the rise of each, and he has now no difficulty in estimating their height." In general things seemed larger than he expected; but the great extent of space did not impress him until he had left the hospital. "When he first looked out of a window on to the street and saw the pavement below" [from the first story], "he said he felt that if he had a stick he should be able to touch it." He did not have the feeling of Cheselden's patient that the objects he saw "touched his eyes." I tried him also with Raehlmann's experiment of looking through a tube at two objects at unequal distances; but he had great difficulty in coming to any conclusion as to which was the nearer. "He did not retain his faculty of moving easily about in the dark. Before the operation he could guide himself fearlessly through a ward without coming in contact with the beds or any other obstacle that might be in the way, but since he has been able to see he says he has lost all that feeling of confidence, and when his eyes are shut he is afraid to move, and is impelled to open them to ascertain where he is going."

Pictures were at first to him "mere masses of confused colour." On my first visit to him I showed him a large coloured picture of a man's head, on the cover of a weekly illustrated paper. After long scrutiny he recognised the nose and mouth, and thus knew that it represented a head. But he was completely puzzled by the hair and by a pair of spectacles on the nose. Of smaller pictures he could make practically nothing. "He cannot tell the photograph of one person from that of another." On October 23rd I showed him a small print of the hospital (taken from a photograph) on the cover of the annual report. After a time he said it was a building; but it seemed to him to be "queer." He then pointed to the gable of another building which appeared in the background. It was without windows and looked comparatively dim. He could not make out what it was, and when I told him it was another building, he found it difficult to understand why it should seem smaller and dimmer than the building in the foreground. He found it difficult to grasp the distinction between the foreground and the background of a picture. Franz's patient had exactly the same difficulty.

The evidences of aesthetic appreciation in the case of Carruth are slight. He is fond of lights and bright things generally. The colour red gave him at once a feeling of pleasure; but dark colours did not specially depress him. Yellow, however, had a remarkable effect upon him. "The first time he saw yellow he became so sick that he thought he would vomit." This feeling has never recurred. I do not know how this is to be explained, but there is doubtless some physiological reason for it. At dusk one evening in summer he was taken to the top of a hill near his native village, and he at once saw the lights of Paisley (several miles off), which his companion had not noticed, and the gleam of light upon a small lake at a considerable distance. When in Bradford last summer he saw a tank with gold-fish in a shop window and was so fascinated that, as he said, "he stood looking at it for twenty minutes and found it difficult to tear himself away." He has a vivid recollection of the pleasure with which he saw the stars on the first night after he left the hospital, and he was specially delighted with "a large star" which he saw low down in the sky. He did not take much aesthetic interest in human faces. He had great pleasure in seeing his mother's face; but he immediately asked if the marks he saw were wrinkles, and he was pleased that he had guessed rightly.

He is still a little slow in recognising small objects with which he is not perfectly familiar. On October 23rd a long pencil was held up before him. It took him rather more than ten seconds to decide what it was, and then he called it a pen.

(*b*) *Visualising, Association, etc.* When I saw him on May 4th he had no experience of visual images. He did not understand what I meant when I questioned him about them; but I suggested to him that he should try to recall objects he had seen, and when I saw him again on May 9th he was able to obtain visual images without difficulty. On October 23rd he could easily picture the starry sky, with the planet, which had specially attracted him, in its right place. He could also picture with great vividness the tank of gold-fish. When he had forgotten the particular place of an object in a room he could now sometimes discover it by visualising and thus seeing in his mind's eye the object in its place. During his blindness his only means of discovering the place of the object in such circumstances was to return to the room and grope for it. Names of places and things with which he was familiar also, in some cases, suggested visual images. Thus the name 'Bradford' immediately gave him a vision of the gold-fish. 'Time' and '3 o'clock' suggested no image; but 'clock' gave him the image of an eight-day clock. In his ordinary association of ideas there seemed to be nothing peculiar. In the blind state it took place mainly through sound (the sound of words), but also to some extent through touch and smell. Now it is often dependent on visual images, as well as suggestive of them. Similarly his thinking in the blind state was mainly word-thinking, while now it is to a great extent picture-thinking. This, of course, is largely due to his great interest in the visible world, which has led to a very rapid modification of his former system of knowledge and interpretation.

He had many dreams in the blind state, and he dreams even more frequently now that he sees. The dreams which he specially remembers are those which he regards as having been fulfilled. He is, as one might expect, very easily satisfied as to the fulfilment of a dream. He told me two of them—one which occurred when he was blind, and another which he had some time after the operation. In the first of these he dreamed that a horse in a grocer's van ran away, as the result of losing a shoe, and jumped over a bridge into a stream. The only imagery in the dream was aural and tactual. He knew that the horse had lost a shoe by the sound of its hoof on the road. He heard a man approaching and talked with him. He remembered the feel of the iron on the end of the shaft of the van, that of the leather of the harness, and that of the shoe which he picked up. The dream, he thought, was fulfilled by the actual running away of a horse and van shortly afterwards, which ended in the horse plunging over a fence. In his visual dream he saw a table spread for tea, with chairs, cups, plates, etc. He sat down and found, to his great disappointment, that there was no bread for him. The 'fulfilment' came when he was asked to supper the following evening and could not accept the invitation because he had another engagement! His dreams in general seem now to be mainly visual. He has no recollection of ever having dreamed a smell.

This is practically all the information I can give regarding Dr Ramsay's patient. I was a good deal disappointed in my last interview with him. I hoped to find that he had taken to some manual occupation, and that it would be possible to get information from him regarding the progress in his knowledge of things. But he has not been doing any sort of work, and has occupied himself with social engagements,-addressing 'revival' meetings and meditating on what he shall say at these meetings. I tried to question him about his meditations, but he would not say much about them.

It seems better to allow the case to speak for itself than to attempt to draw general inferences from it. Some of the material may be useful to one or another psychologist who is following a special line of study. But I should like to draw attention to the quickness of inference, and the rapidity of accommodation to new conditions in the case of Carruth. This, I think, is clearly due to the fact that he had already a considerably developed experience, both cognitive and conative, and that consequently the new sight-experience was easily assimilated. The perceptions of the ball and brick and of the arch illustrated this. This facility of assimilation is much more easily intelligible on the hypothesis of 'acquirement of meaning' and 'complication' than on the 'atomic' or associationist view. A great part of Carruth's quickness was due to his power of rapid inference, which is a feature of highly organised knowledge. His inferring power is probably considerably greater than it would have been had he not been blind—supposing, of course, that other circumstances (*e.g.* his occupation in life, etc.) remained the same. Psychologically, a blind man in his circumstances lives in two worlds—the world as it would be if no one saw, and, in part at least, the world as the result of mental process in human beings who see. He is continually getting messages from this second world which he must somehow interpret, and he is continually being called to do things which it would never have occurred to him to do had there been no seeing persons around him. This involves constant practice in inference or interpretation, with facility and skill as its result. But many blind

people show much less quickness and intelligence than Carruth does. This, however, is a negative confirmation of my argument. For I should attribute Carruth's intelligence to the variety in his life during the blind stage, its many points of contact with the social world of people who see. The record shows that he was engaged in various occupations, hardly any of which could be called merely mechanical. His work was mostly of the nature of direct co-operation with seeing people. On the other hand, consider the case of his sister, on whom Dr Ramsay operated on April 18th and May 1st, and whom I saw on May 9th. She is 33 years of age. "She had never been able to discern objects, though she could tell day from night, distinguish shadows, and even recognise bright colours when she held them close to her eye." During her blind state "she was weak and timid, frightened to go about alone unless in places with which she was perfectly familiar." "She lived mostly indoors and assisted her mother in the general housework and in the care of the children. When out of doors she rarely came against obstacles, but she says that she was prevented from doing so by perceiving their 'shadow,' rather than by any consciousness of their presence through an increased development of the sense of hearing. She seems not to have cultivated either the auditory or the olfactory senses, but to have relied wholly on the sense of touch for information regarding the world around her." "She showed no initiative, but listlessly travelled along the groove in which she found herself placed. When 19 years of age she began to learn the Braille type, and in less than a year was able to read. She took no interest in this, however, and tells me she now never reads at all. At 23 she entered the Blind Asylum and wrought there as a machinist for ten years, doing ordinary work in an ordinary way." Her work in the Blind Asylum was as mechanical as possible—passing the covers of mattresses through a sewing-machine. The contrast between the results of the operation in her case and in that of her brother is remarkable. "Whenever the bandages were removed the patient said she could see. Unlike her brother, she expressed no wonder at what she saw, but she has great difficulty in describing her sensations in such a way as to convey any clear conception of them to another." "Although she is manifestly delighted at her ability to see she never trusts her sight, and always tries to handle an object before naming it. The more closely she is watched the more evident does it become that she really makes very little use of her sight, falling back on her sense of touch for information, just as she had been taught to do in the

Blind Asylum. She does not seem to be able to think through her eyes, if I may so express it." "She does not use her sight to gain increased knowledge of the objects she handles—her touch tells her all she wants to know about them." When I saw her on May 9th I could get no information of value from her; but the contrast between her and her brother impressed me greatly. The deficiency in her intelligence and interest, and her tendency to relapse into the world of the blind seems to me to arise from the narrowness and the mechanical character of her practical life. Her sight is of little use to her because she has few practical interests, and those she has can be quite well satisfied in the blind state. Her experience is too thoroughly stunted to grow under the new conditions.

The special character of Carruth's case ought also, I think, to warn us against supposing that the experiences of an intelligent adult restored to sight are the same as those of a very young child learning to see. The young child can have no such organised experience as a ground for its sight-perceptions any more than it can have a hardened, stunted experience like that of the woman patient. And it is impossible to eliminate from the record of such a case as Carruth's all that is due to his pre-visual experience.

FURTHER NOTE. On April 11th, 1904, Dr Rivers and I tested quantitatively Carruth's perception of certain illusions. Many of the tests failed owing to the imperfect development of his power of grasping lines and figures as a whole and to his difficulty in interpreting figures representing three dimensions. But in the cases of the Müller-Lyer illusion and that of the comparison of vertical and horizontal lines the results were essentially similar to those which appear in persons with normal vision. So far as we could ascertain he had no perception of stereoscopic effects; but this may be due to defective vision in one of the eyes.

At the same time we examined another patient of Dr Ramsay, a young woman who, at the age of 20, recovered vision in one eye as the result of an operation in September, 1903. She had been blind from infancy. Her perception of the Müller-Lyer illusion was similar to that of persons with normal vision. She said that on regaining her sight, she found large objects which she had not handled (*e.g.* carts and horses) to be larger than she expected, while small objects with which touch had made her familiar (*e.g.* household utensils) seemed smaller. She was employed as a cotton-winder, and the only difference which sight made in her work was that she could now do it more quickly. She

could still do the cotton-winding with her eyes closed. In going about, her movements were those rather of a blind person than of one who sees. She could visualise imperfectly. She had no recollection of dreaming during her blind state; but she could now dream. Her dreams, however, were confused, without distinct visual images. She could visualise her home, a table in a room, etc. But the images were not clear, and she could picture people in the room, objects on the table, etc., only after she had thought of them as in the position in which she pictured them.

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